

CLAIMS

1 1.(**withdrawn**) A composition comprising a modified nucleotide including a molecular
2 and/or atomic tag, where the nucleotide alters base incorporation fidelity in a nucleotide
3 polymerizing agent relative to a base incorporation fidelity of the agent in the absence of the
4 modified nucleotide.

1 2.(**withdrawn**) The composition of claim 1, wherein the modified nucleotide comprises
2 a β and/or γ phosphate modified nucleotide.

1 3.(**withdrawn**) The composition of claim 1, wherein the modified nucleotide comprises
2 a β phosphate modified nucleotide.

1 4.(**withdrawn**) The composition of claim 1, wherein the modified nucleotide comprises
2 a γ phosphate modified nucleotide.

1 5.(**withdrawn**) The composition of claim 4, wherein the tag comprises a molecule.

1 6.(**withdrawn**) The composition of claim 5, wherein the tag is ANS.

1 7.(**currently amended**) A method comprising the step of adding a modified nucleotide
2 including a molecular and/or atomic tag, ~~where the nucleotide alters base incorporation~~
3 ~~fidelity of a nucleotide polymerizing agent relative to a base incorporation fidelity of the~~
4 ~~agent in the absence of the modified nucleotide,~~ to a nucleotide polymerization medium
5 comprising a nucleotide polymerizing agent, where the modified nucleotide alters base
6 incorporation fidelity of a nucleotide polymerizing agent relative to a base incorporation
7 fidelity of the polymerizing agent in the absence of the modified nucleotide.

1 8.(original) The method of claim 7, wherein the modified nucleotide comprises a β and/or
2 γ phosphate modified nucleotide.

1 9.(original) The method of claim 7, wherein the modified nucleotide comprises a β
2 phosphate modified nucleotide.

1 10.(original) The method of claim 7, wherein the modified nucleotide comprises a γ
2 phosphate modified nucleotide.

1 11.(original) The method of claim 10, wherein the tag comprises a molecule.

1 12.(currently amended) The method of claim 11, wherein the tag ~~is~~ comprises
2 aminonaphthalene-1-sulfonate (ANS).

1 13.(currently amended) A method comprising the step of adding a modified nucleotide
2 including a molecular and/or atomic tag, ~~where the nucleotide alters base incorporation~~
3 ~~fidelity of a nucleotide polymerizing agent relative to a base incorporation fidelity of the~~
4 ~~agent in the absence of the modified nucleotide,~~ to an assay for extending a nucleotide
5 sequence, where the modified nucleotide alters base incorporation fidelity of a nucleotide
6 polymerizing agent relative to a base incorporation fidelity of the polymerizing agent in the
7 absence of the modified nucleotide, and the assay is selected from the group consisting of
8 genotyping for *in vitro* reproductive methods (human and other organisms); single nucleotide
9 polymorphism (SNP) detection; DNA sequencing; RNA sequencing; single nucleotide
10 extension assays; amplified DNA product assays; rolling circle product assays; PCR product
11 assays; allele-specific primer extension assays; single-molecule arrays (DNA, RNA, protein)
12 assays; and drug toxicity evaluation assays.

1 14.(withdrawn) A method for making blunt-ended fragments comprising the steps of
2 amplifying a DNA fragment in the presence of a nucleotide including a molecular and/or
3 atomic tag on a γ phosphate group and/or a base moiety, where the tag alters fidelity of base
4 incorporation and decreases or eliminates non-templated addition of a base to the 3' end of
5 the DNA fragment being amplified.

1 15. A kit for performing a nucleotide polymerizing reaction comprising polymerizing
2 reagents and at least one modified nucleotide including an atomic and/or molecular tag,
3 where the modified nucleotide alters extension fidelity.

1 16.(withdrawn) A method of inhibiting or preventing pyrophosphorolysis during
2 synthesis of a nucleic acid molecule, said method comprising

3 (a) combining a primer with a nucleic acid template under conditions sufficient to form a
4 hybridized product; and

5 (b) incubating the hybridized product with a polymerase in the presence or absence of an
6 enzyme selected from the group consisting of a pentosyltransferase, a phosphotransferase
7 with alcohol group as acceptor, a nucleotidyltransferase, and a carboxy-lyase, under
8 conditions sufficient to form a second nucleic acid molecule complementary to all or a
9 portion of the nucleic acid template,

10 where a tagged nucleotide comprises an atomic and/or molecular tag or moiety
11 attached to and/or associated with a β and/or γ -phosphate and/or a base moiety of the
12 nucleotide is added at either or both steps to inhibit or prevent pyrophosphorolysis during
13 synthesis of a nucleic acid molecule.

1 17.(withdrawn) A composition comprising a nucleotide including a molecular and/or
2 atomic tag on a phosphate group adapted to alter the fidelity of viral replication.

1 18.(withdrawn) The composition of claim 17, wherein the virus is HIV.

1 19.(**withdrawn**) A method for increasing the fidelity of replication comprising
2 administering an therapeutically effective amount of a nucleotide including a molecular
3 and/or atomic tag on a γ phosphate group to an animal including a human, where the
4 nucleotide is designed to increase base incorporation fidelity during replication.

1 20.(**withdrawn**) The method of claim 19, wherein the replication is caused by an HIV
2 virus.

1 21.(**new**) The method of claim 7, wherein the tag comprises a molecule covalently
2 bonded to the modified nucleotide through a linker.

1 22.(**new**) The method of claim 7, wherein the tag comprises a molecule covalently
2 bonded to the modified nucleotide.

1 23.(**new**) The method of claim 11, wherein the molecule comprises a fluorophore
2 selected from the group consisting of 4-acetamido-4'isothiocyanatostilbene-2,2'disulfonic
3 acid; acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino - 3-vinylsulfonyl phenyl]
5 naphthalimide-3,5 disulfonate; - (4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY;
6 Brilliant Yellow; coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC,
7 Coumarin 120), 7-amino-4trifluoromethylcouluarin (Coumaran 151); cyanine dyes;
8 cyanosine; 4', 6-diaminidino-2phenylindole (DAPI); 5', 5''-dibromopyrogallol-
9 sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-
10 methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-
11 disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic acid; 5-dimethylamino
12 naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-dimethylaminophenylazophenyl-
13 4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin

and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium; fluorescein and derivatives: 5carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl) aminofluorescein (DTAF), 2', 7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein, fluorescein isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline; Phenol Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and derivatives: pyrene, pyrene butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (Cibacron™ Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX), 6carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod), rhodamine B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B, sulforhodamine 101, sulfonyl chloride derivative of sulforhodamine 101 (Texas Red); N, N, N', N'-tetramethyl-6-carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo cyanine; and naphthalo cyanine.

24.(new) The method of claim 11, wherein the molecule is selected from the group consisting of alkyl groups having between 1 and 30 carbon atoms, aryl groups having between about 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between about 7 and about 40 carbon atoms, or mixture or combinations thereof, where the carbon atoms are replaced by one or more hetero atoms in the structure provided the structure represents a stable molecular system, where the hetero atoms selected from the group consisting of P, S, Si, N, and O.

25.(new) The method of claim 11, wherein the molecule is selected from the group consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-methylphenol, 6-chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-iodonaphthol, 4-bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline,

4-nitronaphthol, 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-bromonaphthol, 6-nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-methylnaphthol, fluorescein, 6-methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-propyne, 1-hydroxy-4-pentyne, 1-hydroxy-3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol, Propanol, Isopropanol, Butanol, Tert-butanol, Hexanol, Cyclohexanol, Heptanol, Octanol, Decanol, Undecanol, Dodecanol, 1-acetoxymethanol (CH₃OOCH₂-O-NTP), 2-acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol, 6-acetoxyhexanol, 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol, 1-hydroxy-3-propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde, 1-hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-Butanone, Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-hydroxypyridine, 4-Acetoxymethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-acetoxymethyl-3-hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-methoxyphenol 6-methoxy-8-hydroxyquinoline, 4-ethylphenol, 4-methyl-8-hydroxyquinoline, 4-butylphenol, 6-nitro-8-hydroxyquinoline, naphthol, 4-acetoxymethyl-8-hydroxyquinoline, 4 or 6 or 8 methylnaphthol pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-8-hydroxypyrene, 4 or 6 or 8 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-(carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthol, 6-carboxymethyl-2,7-dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol, 2-nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

26.(new) The method of claim 10, wherein the modified nucleotide is selected from the group consisting of Adenosine-5'- (γ-ANS) triphosphate, Guanosine-5'- (γ-ANS) triphosphate, Cytosine-5'- (γ-ANS) triphosphate, Thymidine-5'- (γ-ANS) triphosphate, Adenosine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-iodonaphthyl), Guanosine-

5 5'- (γ-4-nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ-6-methylnaphthyl)
6 triphosphate, Cytosine-5'- (γ-4-nitrophenyl) triphosphate, Thymidine-5'- (γ-4-nitrophenyl)
7 triphosphate, Adenosine-5'- (γ-6-methoxynaphthyl) triphosphate, Uracil-5'- (γ-4-nitrophenyl)
8 triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-
9 6-aminonaphthyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ-4-
10 nitrophenyl) triphosphate, Adenosine-5'- (γ-6-nitronaphthyl) triphosphate, 2', 3'-didehydro-2',
11 3'-dideoxythymidine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-6-chloronaphthyl)
12 triphosphate, Adenosine-5'- (γ-4-aminophenyl) triphosphate, Adenosine-5'- (γ-6-
13 bromonaphthyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl) triphosphate, Adenosine-5'-
14 (γ-6-iodonaphthyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl) triphosphate,
15 Adenosine-5'- (γ-4'-hydroxybiphenyl) triphosphate, Adenosine-5'- (γ-4-chlorophenyl)
16 triphosphate, Adenosine-5'- (γ-8-quinolyl) triphosphate, Adenosine-5'- (γ-4-bromophenyl)
17 triphosphate, Adenosine-5'- (γ-3-pyridyl) triphosphate, Adenosine-5'- (γ-umbelliferone),
18 Adenosine-5'- (γ-4-iodophenyl) triphosphate, Adenosine-5'- (γ-4-nitronaphthyl)
19 triphosphate, Adenosine-5'- (γ-resorufin) triphosphate, Adenosine-5'- (γ-pyrene)
20 triphosphate, Adenosine-5'- (γ-4-aminonaphthyl) triphosphate, Adenosine-5'- (γ-anthracene)
21 triphosphate, Adenosine-5'- (γ-6-nitroanthracene) triphosphate, Adenosine-5'- (γ-4-
22 methylnaphthyl) triphosphate, Adenosine-5'- (γ-flavonyl) triphosphate, Adenosine-5'- (γ-4-
23 methoxynaphthyl) triphosphate, Adenosine-5'- (γ-fluorescein) triphosphate, Adenosine-5'-
24 (γ-benzoflavone) triphosphate, Adenosine-5'- (γ-4-chloronaphthyl) triphosphate, Adenosine-
25 5'- (γ- (4-nitrophenyl)- γ'- (4-aminophenyl) triphosphate, Adenosine-5'- (γ-4-
26 bromonaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)- γ'- (4-nitronaphthyl)
27 triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
28 acetoxypentyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Cytosine-5'- (γ-methyl)
29 triphosphate, Adenosine-5'- (γ-acetoxymethyl) triphosphate (CH₃OCCH₃-O-NTP),
30 Thymidine-5'- (γ-methyl) triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
31 acetoxylethyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-methyl) triphosphate,
32 Adenosine-5'- (γ-acetoxypentyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ-methyl)

33 triphosphate, Adenosine-5'- (γ, acetoxypentyl) triphosphate, 2', 3'-didehydro-2', 3'-
34 dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-acetoxyhexyl) triphosphate,
35 Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-2-nitroethyl) triphosphate,
36 Adenosine-5'- (γ-propyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate, Adenosine-5'-
37 (γ-3-nitropropyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate, Adenosine-5'- (γ-octyl)
38 triphosphate, Adenosine-5'- (γ-4-nitrobutyl) triphosphate, Adenosine-5'- (γ-decyl)
39 triphosphate, Adenosine-5'- (γ-dodecyl) triphosphate, Adenosine-5'- (γ-5-
40 nitropentyl) triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-tert-
41 butyl) triphosphate, Adenosine-5'- (γ-methyl)- (γ'-ethyl) triphosphate, Adenosine-5'- (γ-
42 cyclohexyl) triphosphate, Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate, Adenosine-5'-
43 (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-3-butenyl) triphosphate, Guanosine-5'- (γ-2-
44 propenyl) triphosphate, Adenosine-5'- (γ-4-pentenyl) triphosphate, Cytosine-5'- (γ-2-
45 propenyl) triphosphate, Adenosine-5'- (γ-5-hexenyl) triphosphate, Thymidine-5'- (γ-2-
46 propenyl) triphosphate, Adenosine-5'- (γ-cyclohexenyl) triphosphate, Uracil-5'- (γ-2-
47 propenyl) triphosphate, Adenosine-5'- (γ-3-propanaldehyde) triphosphate, 3'-azido-3'-
48 deoxythymidine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-4-butanaldehyde)
49 triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'-
50 (γ-3-butanone) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-2-propenyl)
51 triphosphate, Adenosine-5'- (γ-2-propynyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-
52 (γ-2-propynyl) triphosphate, Guanosine-5'- (γ-2-propynyl) triphosphate, Cytosine-5'- (γ-2-
53 propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-2-propynyl)
54 triphosphate, Thymidine 5'- (γ-2-propynyl) triphosphate, Uracil-5'- (γ-2-propynyl)
55 triphosphate, Adenosine-5'- (γ-3-butyryl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-
56 propynyl) triphosphate, Adenosine-5'- (γ-4-pentyryl) triphosphate, Adenosine-5'- (γ-5-
57 pentyryl) triphosphate, Adenosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4 or 6
58 or 8 acetoxymethyl naphthyl) triphosphate, Guanosine-5'- (γ-4-phenyl) triphosphate,
59 Cytosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4-methylpyridyl) triphosphate,
60 Thymidine-5'- (γ-4-phenyl) triphosphate, Uracil-5'- (γ-4-phenyl) triphosphate, Adenosine-5'-

(γ - (5-methoxypyridyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (5-nitropyridyl)triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (5-acetoxymethylpyridyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (6-methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ -4-carboxyphenyl) triphosphate, Adenosine-5'-(γ -(6-methoxy-1-quinolyl)triphosphate, Adenosine-5'- (γ - (4-acetoxymethyl) phenyl) triphosphate, Adenosine-5'- (γ - (4-methyl-1-quinolyl)triphosphate, Adenosine-5'- (γ -4-nitrophenyl) triphosphate, Adenosine-5'- (γ -4-methylphenyl)triphosphate, Adenosine-5'- (γ - (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ -4-methoxyphenyl) triphosphate, Adenosine-5'- (γ - (4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'- (γ -4-ethylphenyl) triphosphate, Adenosine-5'- (γ - (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ -4-butylphenyl) triphosphate, Adenosine 5'-(γ -naphthyl) triphosphate, Adenosine-5'- (γ - (6-ethylpyrenyl) triphosphate, Adenosine-5'- (γ - (4 or 6 or 8 methyl naphthyl)triphosphate, Adenosine-5'- (γ - (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ - (4 or 6 or 8 methoxynaphthyl) triphosphate, Adenosine-5'- (γ -6- (carboxysuccinimidyl fluorescein) triphosphate, Adenosine-5'- (γ - (4 or 6 or 8 nitro naphthyl) triphosphate. Adenosine-5'- (γ -6-carboxymethyl-2, 7-dichlorofluorescein) triphosphate, Adenosine-5'- (γ - (4 or 6 or 8 ethyl naphthyl) triphosphate, Adenosine-5'- (γ -4-phenyl)- (γ' -4 nitrophenyl) triphosphate, Adenosine-5'- (γ - (4 or 6 or 8 butyl naphthyl)triphosphate, Adenosine-5'- (γ -4-phenyl)- (γ' -4 aminophenyl)triphosphate, Adenosine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -3-aminopropyl) triphosphate, Guanosine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -4-aminobutyl) triphosphate, Cytosine-5'- (γ -methyl) triphosphate Adenosine-5'- (γ -cyclohexyl) triphosphate, Thymidine-5'- (γ -methyl) triphosphate Adenosine-5'- (γ -2-carboxyethyl) triphosphate, Uracil-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -3-carboxypropyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (7-methyl) triphosphate, Adenosine-5'- (γ -4-carboxybutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -2-hydroxyethyl) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'-(γ -methyl)triphosphate, Adenosine-5'- (γ -3-hydroxypropyl)

triphosphate, Adenosine-5'- (γ -ethyl) triphosphate, Adenosine-5'- (γ -propyl) triphosphate, Adenosine-5'- (γ -4-hydroxybutyl) triphosphate, Adenosine-5'- (γ -4-butyl) triphosphate, Adenosine-5'- (γ -2-nitroethyl) triphosphate, Adenosine-5'- (γ -hexyl) triphosphate, Adenosine-5'- (γ -3-nitropropyl) triphosphate, Adenosine-5'- (γ -isopropyl) triphosphate, Adenosine-5'- (γ -4-nitrobutyl) triphosphate, Adenosine-5'- (γ -tert-butyl) triphosphate, Adenosine-5'- (γ -methyl)- (γ' -ethyl)triphosphate, Adenosine-5'- (γ -cyclohexyl) triphosphate, Adenosine-5'- (γ -2-aminoethyl)triphosphate, and Adenosine-5'- (γ -methyl)- (γ' -propyl) triphosphate.

27.(new) The method of claim 13, wherein the tag comprises a molecule covalently bonded to the modified nucleotide through a linker.

28.(new) The method of claim 13, wherein the tag comprises a molecule covalently bonded to the modified nucleotide.

29.(new) The method of claim 13, wherein the modified nucleotide comprises a β and/or γ phosphate modified nucleotide.

30.(new) The method of claim 13, wherein the modified nucleotide comprises a β phosphate modified nucleotide.

31.(new) The method of claim 13, wherein the modified nucleotide comprises a γ phosphate modified nucleotide.

32.(new) The method of claim 28, wherein the molecule comprises a fluorophore selected from the group consisting of 4-acetamido-4'-isothiocyanatostilbene-2,2'-disulfonic acid; acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl) aminonaphthalene-1-sulfonic acid (EDANS); 4-amino - 3-vinylsulfonyl phenyl]

naphthalimide-3,5 disulfonate; –(4-anilino-1-naphthyl) maleimide; anthranilamide; BODIPY; Brilliant Yellow; coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC, Coumarin 120), 7-amino-4-trifluoromethylcoumarin (Coumarin 151); cyanine dyes; cyanosine; 4', 6-diaminidino-2-phenylindole (DAPI); 5', 5''-dibromopyrogallol-sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic acid; 5-dimethylamino naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-dimethylaminophenylazophenyl-4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium; fluorescein and derivatives: 5-carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl) aminofluorescein (DTAF), 2', 7'-dimethoxy-4',5'-dichloro-6-carboxyfluorescein (JOE), fluorescein, fluorescein isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green isothiocyanate; 4-methylumbelliferone-ortho cresolphthalein; nitrotyrosine; pararosaniline; Phenol Red; B-phycoerythrin; o-phthalaldehyde; pyrene and derivatives: pyrene, pyrene butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (Cibacron™ Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX), 6-carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod), rhodamine B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B, sulforhodamine 101, sulfonyl chloride derivative of sulforhodamine 101 (Texas Red); N, N, N', N'-tetramethyl-6-carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalocyanine; and naphthalocyanine.

33.(new) The method of claim 28, wherein the molecule is selected from the group consisting of alkyl groups having between 1 and 30 carbon atoms, aryl groups having between about 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between

about 7 and about 40 carbon atoms, or mixture or combinations thereof, where the carbon atoms are replaced by one or more heteroatoms in the structure provided the structure represents a stable molecular system, where the heteroatoms selected from the group consisting of P, S, Si, N, and O.

34.(new) The method of claim 28, wherein the molecule is selected from the group consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-methylphenol, 6-chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-iodonaphthol, 4-bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline, 4-nitronaphthol, 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-bromonaphthol, 6-nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-methylnaphthol, fluorescein, 6-methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-propyne, 1-hydroxy-4-pentyne, 1-hydroxy-3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol, Propanol, Isopropanol, Butanol, Tert-butanol, Hexanol, Cyclohexanol, Heptanol, Octanol, Decanol, Undecanol, Dodecanol, 1-acetoxymethanol (CH₃OCCH₂-O-NTP), 2-acetoxyethanol, 3-acetoxypentanol, 4-acetoxybutanol, 5-acetoxypentanol, 6-acetoxyhexanol, 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol, 1-hydroxy-3-propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde, 1-hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-Butanone, Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-hydroxypyridine, 4-Acetoxymethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-acetoxymethyl-3-hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-methoxyphenol, 6-methoxy-8-hydroxyquinoline, 4-ethylphenol, 4-methyl-8-hydroxyquinoline, 4-butylphenol, 6-nitro-8-hydroxyquinoline, naphthol, 4-acetoxymethyl-8-hydroxyquinoline, 4 or 6 or 8 methylnaphthol pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-8-hydroxypyrene, 4 or 6 or 8 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol, 6-

24 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthol, 6-carboxymethyl-
25 2, 7-dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
26 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol,
27 2-nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 35.(new) The method of claim 31, wherein the modified nucleotide is selected from the
2 group consisting of Adenosine-5'- (γ -ANS) triphosphate, Guanosine-5'- (γ -ANS)
3 triphosphate, Cytosine-5'- (γ -ANS) triphosphate, Thymidine-5'- (γ -ANS) triphosphate,
4 Adenosine-5'- (γ -4-nitrophenyl) triphosphate, Adenosine-5'- (γ -4-iodonaphthyl), Guanosine-
5 5'- (γ -4-nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ -6-methylnaphthyl)
6 triphosphate, Cytosine-5'- (γ -4-nitrophenyl) triphosphate, Thymidine-5'- (γ -4-nitrophenyl)
7 triphosphate, Adenosine-5'- (γ -6-methoxynaphthyl) triphosphate, Uracil-5'- (γ -4-nitrophenyl)
8 triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ -4-nitrophenyl) triphosphate, Adenosine-5'- (γ -
9 6-aminonaphthyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ -4-
10 nitrophenyl) triphosphate, Adenosine-5'- (γ -6-nitronaphthyl) triphosphate, 2', 3'-didehydro-2',
11 3'-dideoxythymidine-5'- (γ -4-nitrophenyl) triphosphate, Adenosine-5'- (γ -6-chloronaphthyl)
12 triphosphate, Adenosine-5'- (γ -4-aminophenyl) triphosphate, Adenosine-5'- (γ -6-
13 bromonaphthyl) triphosphate, Adenosine-5'- (γ -4-methylphenyl) triphosphate, Adenosine-5'-
14 (γ -6-iodonaphthyl) triphosphate, Adenosine-5'- (γ -4-methoxyphenyl) triphosphate,
15 Adenosine-5'- (γ -4'-hydroxybiphenyl) triphosphate, Adenosine-5'- (γ -4-chlorophenyl)
16 triphosphate, Adenosine-5'- (γ -8-quinolyl) triphosphate, Adenosine-5'- (γ -4-bromophenyl)
17 triphosphate, Adenosine-5'- (γ -3-pyridyl) triphosphate, Adenosine-5'- (γ -umbelliferone),
18 Adenosine-5'- (γ -4-iodophenyl) triphosphate, Adenosine-5'- (γ -4-nitronaphthyl)
19 triphosphate, Adenosine-5'- (γ -resorufin) triphosphate, Adenosine-5'- (γ -pyrene)
20 triphosphate, Adenosine-5'- (γ -4-aminonaphthyl) triphosphate, Adenosine-5'- (γ -anthracene)
21 triphosphate, Adenosine-5'- (γ -6-nitroanthracene) triphosphate, Adenosine-5'- (γ -4-
22 methylnaphthyl) triphosphate, Adenosine-5'- (γ -flavonyl) triphosphate, Adenosine-5'- (γ -4-
23 methoxynaphthyl) triphosphate, Adenosine-5'- (γ -fluorescein) triphosphate, Adenosine-5'-

(γ -benzoflavone) triphosphate, Adenosine-5'-(γ -4-chloronaphthyl) triphosphate, Adenosine-5'-(γ -(4-nitrophenyl)- γ' -(4-aminophenyl) triphosphate, Adenosine-5'-(γ -4-bromonaphthyl) triphosphate, Adenosine-5'-(γ -(4-nitrophenyl)- γ' -(4-nitronaphthyl) triphosphate, Adenosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxypentyl) triphosphate, Guanosine-5'-(γ -methyl) triphosphate, Cytosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxymethyl) triphosphate (CH₃OOCCCH₂-O-NTP), Thymidine-5'-(γ -methyl) triphosphate, Uracil-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxylethyl) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxylbutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ , acetoxypentyl) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxylhexyl) triphosphate, Adenosine-5'-(γ -ethyl) triphosphate, Adenosine-5'-(γ -2-nitroethyl) triphosphate, Adenosine-5'-(γ -propyl) triphosphate, Adenosine-5'-(γ -4-butyl) triphosphate, Adenosine-5'-(γ -3-nitropropyl) triphosphate, Adenosine-5'-(γ -hexyl) triphosphate, Adenosine-5'-(γ -octyl) triphosphate, Adenosine-5'-(γ -4-nitrobutyl) triphosphate, Adenosine-5'-(γ -decyl) triphosphate, Adenosine-5'-(γ -dodecyl) triphosphate, Adenosine-5'-(γ -5-nitropentyl) triphosphate, Adenosine-5'-(γ -isopropyl) triphosphate, Adenosine-5'-(γ -tert-butyl) triphosphate, Adenosine-5'-(γ -methyl)-(γ' -ethyl) triphosphate, Adenosine-5'-(γ -cyclohexyl) triphosphate, Adenosine-5'-(γ -methyl)-(γ' -propyl) triphosphate, Adenosine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -3-butenyl) triphosphate, Guanosine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -4-pentenyl) triphosphate, Cytosine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -5-hexenyl) triphosphate, Thymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -cyclohexenyl) triphosphate, Uracil-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -3-propanaldehyde) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -4-butanaldehyde) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -3-butanone) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -2-propynyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'

52 (γ-2-propynyl) triphosphate, Guanosine-5'- (γ-2-propynyl) triphosphate, Cytosine-5'- (γ-2-
53 propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-2-propynyl)
54 triphosphate Thymidine 5'- (γ-2-propynyl) triphosphate, Uracil-5'- (γ-2-propynyl)
55 triphosphate, Adenosine-5'- (γ-3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-
56 propynyl) triphosphate, Adenosine-5'- (γ-4-pentynyl) triphosphate, Adenosine-5'- (γ-5-
57 pentynyl) triphosphate, Adenosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4 or 6
58 or 8 acetoxymethyl naphthyl) triphosphate, Guanosine-5'- (γ-4-phenyl) triphosphate,
59 Cytosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4-methylpyridyl)triphosphate,
60 Thymidine-5'- (γ-4-phenyl) triphosphate, Uracil-5'- (γ-4-phenyl) triphosphate, Adenosine-5'-
61 (γ- (5-methoxypyridyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-4-phenyl)
62 triphosphate, Adenosine-5'- (γ- (5-nitropyridyl)triphosphate, 3'-azido-2',3'-dideoxythymidine-
63 5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-acetoxymethylpyridyl) triphosphate, 2',
64 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (6-
65 methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-carboxyphenyl) triphosphate,
66 Adenosine-5'- (γ- (6-methoxy-1-quinolyl)triphosphate, Adenosine-5'- (γ- (4-acetoxymethyl)
67 phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl)triphosphate, Adenosine-5'-
68 (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl)triphosphate, Adenosine-5'-
69 (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl) triphosphate,
70 Adenosine-5'- (γ- (4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'- (γ-4-ethylphenyl)
71 triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
72 butylphenyl) triphosphate, Adenosine 5'- (γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
73 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl)triphosphate,
74 Adenosine-5'- (γ- (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
75 methoxynaphthyl) triphosphate, Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein)
76 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-
77 carboxymethyl-2, 7-dichlorofluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl
78 naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4 nitrophenyl) triphosphate,
79 Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl)triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4

aminophenyl)triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-aminopropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-4-aminobutyl) triphosphate, Cytosine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-cyclohexyl) triphosphate, Thymidine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-2-carboxyethyl) triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-carboxypropyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (7-methyl) triphosphate, Adenosine-5'- (γ-4-carboxybutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-2-hydroxyethyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ-methyl)triphosphate, Adenosine-5'- (γ-3-hydroxypropyl) triphosphate, Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-propyl) triphosphate, Adenosine-5'- (γ-4-hydroxybutyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate, Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate, Adenosine-5'- (γ-3-nitropropyl) triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-4-nitrobutyl) triphosphate, Adenosine-5'- (γ-tert-butyl) triphosphate ,Adenosine-5'- (γ-methyl)-(γ'-ethyl)triphosphate, Adenosine-5'- (γ-cyclohexyl) triphosphate, Adenosine-5'- (γ-2-aminoethyl)triphosphate, and Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate.

36.(new) The method of claim 7, wherein the polymerizing agent is selected from the group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.

37.(new) The method of claim 13, wherein the polymerizing agent is selected from the group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.

38.(new) The kit of claim 15, wherein the tag comprises a molecule covalently bonded to the modified nucleotide through a linker.

1 39.(new) The kit of claim 15, wherein the tag comprises a molecule covalently bonded
2 to the modified nucleotide.

1 40.(new) The kit of claim 15, wherein the modified nucleotide comprises a β and/or γ
2 phosphate modified nucleotide.

1 41.(new) The kit of claim 15, wherein the modified nucleotide comprises a β phosphate
2 modified nucleotide.

1 42.(new) The kit of claim 15, wherein the modified nucleotide comprises a γ phosphate
2 modified nucleotide.

1 43.(new) The kit of claim 39, wherein the molecule comprises a fluorophore selected
2 from the group consisting of 4-acetamido-4'isothiocyanatostilbene-2,2'disulfonic acid;
3 acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino - 3-vinylsulfonyl phenyl]
5 naphthalimide-3,5 disulfonate; -(4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY;
6 Brilliant Yellow; coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC,
7 Coumarin 120), 7-amino-4trifluoromethylcouluarin (Coumaran 151); cyanine dyes;
8 cyanosine; 4', 6-diaminidino-2phenylindole (DAPI); 5', 5''-dibromopyrogallol-
9 sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-
10 methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-
11 disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic acid; 5-dimethylamino
12 naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-dimethylaminophenylazophenyl-
13 4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin
14 and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium; fluorescein and
15 derivatives: 5carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl) aminofluorescein
16 (DTAF), 2', 7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein, fluorescein

17 isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green
18 isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline;
19 Phenol Red; B-phycoerythrin; o-phthalaldehyde; pyrene and derivatives: pyrene, pyrene
20 butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (Cibacron™
21 Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX),
22 6carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod),
23 rhodamine B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B,
24 sulforhodamine 101, sulfonyl chloride derivative of sulforhodamine 101 (Texas Red); N, N,
25 N', N'-tetramethyl-6-carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl
26 rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy
27 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo cyanine; and naphthalo
28 cyanine.

1 44.(new) The kit of claim 39, wherein the molecule is selected from the group consisting
2 of alkyl groups having between 1 and 30 carbon atoms, aryl groups having between about
3 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between about 7 and about
4 40 carbon atoms, or mixture or combinations thereof, where the carbon atoms are replace by
5 one or more hetero atoms in the structure provided the structure represents a stable molecular
6 system, where the hetero atoms selected from the group consisting of P, S, Si, N, and O.

1 45.(new) The kit of claim 39, wherein the molecule is selected from the group consisting
2 of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-methylphenol, 6-
3 chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-iodonaphthol, 4-
4 bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline, 4-nitronaphthol,
5 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-
6 methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-
7 bromonaphthol, 6-nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-
8 methylnaphthol, fluorescein, 6-methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-

propyne, 1-hydroxy-4-pentyne, 1-hydroxy-3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol, Propanol, Isopropanol, Butanol, Tert-butanol, Hexanol, Cyclohexanol, Heptanol, Octanol, Decanol, Undecanol, Dodecanol, 1-acetoxymethanol (CH₃OCCH₂-O-NTP), 2-acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol, 6-acetoxyhexanol, 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol, 1-hydroxy-3-propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde, 1-hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-Butanone, Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-hydroxypyridine, 4-Acetoxymethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-acetoxymethyl-3-hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-methoxyphenol 6-methoxy-8-hydroxyquinoline, 4-ethylphenol, 4-methyl-8-hydroxyquinoline, 4-butylphenol, 6-nitro-8-hydroxyquinoline, naphthol, 4-acetoxymethyl-8-hydroxyquinoline, 4 or 6 or 8 methyl naphthol pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-8-hydroxypyrene, 4 or 6 or 8 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-(carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthol, 6-carboxymethyl-2, 7-dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol, 2-nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

46.(new) The kit of claim 42, wherein the modified nucleotide is selected from the group consisting of Adenosine-5'- (γ-ANS) triphosphate, Guanosine-5'- (γ-ANS) triphosphate, Cytosine-5'- (γ-ANS) triphosphate, Thymidine-5'- (γ-ANS) triphosphate, Adenosine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-iodonaphthyl), Guanosine-5'- (γ-4-nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ-6-methylnaphthyl) triphosphate, Cytosine-5'- (γ-4-nitrophenyl) triphosphate, Thymidine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-6-methoxynaphthyl) triphosphate, Uracil-5'- (γ-4-nitrophenyl) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ-4-nitrophenyl)triphosphate, Adenosine-5'- (γ-6-

9 aminonaphthyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ -4-
 10 nitrophenyl)triphosphate, Adenosine-5'-(γ -6-nitronaphthyl) triphosphate, 2', 3'-didehydro-2',
 11 3'-dideoxythymidine-5'- (γ -4-nitrophenyl)triphosphate, Adenosine-5'- (γ -6-chloronaphthyl)
 12 triphosphate, Adenosine-5'- (γ -4-aminophenyl) triphosphate, Adenosine-5'- (γ -6-
 13 bromonaphthyl) triphosphate, Adenosine-5'- (γ -4-methylphenyl) triphosphate, Adenosine-5'-
 14 (γ -6-iodonaphthyl) triphosphate, Adenosine-5'- (γ -4-methoxyphenyl) triphosphate,
 15 Adenosine-5'-(γ -4'-hydroxybiphenyl) triphosphate, Adenosine-5'- (γ -4-chlorophenyl)
 16 triphosphate, Adenosine-5'- (γ -8-quinolyl) triphosphate, Adenosine-5'- (γ -4-bromophenyl)
 17 triphosphate, Adenosine-5'- (γ -3-pyridyl) triphosphate, Adenosine-5'- (γ -umbelliferone),
 18 Adenosine-5'- (γ -4-iodophenyl) triphosphate, Adenosine-5'- (γ -4-nitronaphthyl)
 19 triphosphate, Adenosine-5'- (γ -resorufin) triphosphate, Adenosine-5'- (γ -pyrene)
 20 triphosphate, Adenosine-5'- (γ -4-aminonaphthyl) triphosphate, Adenosine-5'- (γ -anthracene)
 21 triphosphate, Adenosine-5'-(Γ -6-nitroanthracene) triphosphate, Adenosine-5'- (γ -4-
 22 methylnaphthyl) triphosphate, Adenosine-5'- (γ -flavonyl) triphosphate, Adenosine-5'-(γ -4-
 23 methoxynaphthyl) triphosphate, Adenosine-5'-(γ -fluorescein) triphosphate, Adenosine-5'-
 24 (γ -benzoflavone) triphosphate, Adenosine-5'- (γ -4-chloronaphthyl) triphosphate, Adenosine-
 25 5'- (γ - (4-nitrophenyl)- γ' - (4-aminophenyl) triphosphate, Adenosine-5'- (γ -4-
 26 bromonaphthyl) triphosphate, Adenosine-5'- (γ - (4-nitrophenyl)- γ' - (4-nitronaphthyl)
 27 triphosphate, Adenosine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -
 28 acetoxypentyl)triphosphate, Guanosine-5'- (γ -methyl) triphosphate, Cytosine-5'- (γ -methyl)
 29 triphosphate, Adenosine-5'- (γ -acetoxymethyl)triphosphate (CH₃OCCH₃-O-NTP),
 30 Thymidine-5'- (γ -methyl) triphosphate, Uracil-5'- (γ -methyl) triphosphate, Adenosine-5'-(γ -
 31 acetoxyethyl) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -methyl)triphosphate,
 32 Adenosine-5'- (γ -acetoxybutyl)triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ -methyl)
 33 triphosphate, Adenosine-5'- (γ , acetoxypentyl) triphosphate, 2', 3'-didehydro-2', 3'-
 34 dideoxythymidine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ - acetoxyhexyl) triphosphate,
 35 Adenosine-5'- (γ -ethyl) triphosphate, Adenosine-5'- (γ -2-nitroethyl) triphosphate,
 36 Adenosine-5'- (γ -propyl) triphosphate, Adenosine-5'- (γ -4-butyl) triphosphate, Adenosine-5'-

(γ -3-nitropropyl) triphosphate, Adenosine-5'-(γ -hexyl) triphosphate, Adenosine-5'-(γ -octyl) triphosphate, Adenosine-5'-(γ -4-nitrobutyl) triphosphate, Adenosine-5'-(γ -decyl) triphosphate, Adenosine-5'-(γ -dodecyl) triphosphate, Adenosine-5'-(γ -5-nitropentyl) triphosphate, Adenosine-5'-(γ -isopropyl) triphosphate, Adenosine-5'-(γ -tert-butyl) triphosphate, Adenosine-5'-(γ -methyl)-(γ' -ethyl) triphosphate, Adenosine-5'-(γ -cyclohexyl) triphosphate, Adenosine-5'-(γ -methyl)-(γ' -propyl) triphosphate, Adenosine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -3-butenyl) triphosphate, Guanosine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -4-pentenyl) triphosphate, Cytosine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -5-hexenyl) triphosphate, Thymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -cyclohexenyl) triphosphate, Uracil-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -3-propanaldehyde) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -4-butanaldehyde) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -3-butanone) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -2-propenyl) triphosphate, Adenosine-5'-(γ -2-propynyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-(γ -2-propynyl) triphosphate, Guanosine-5'-(γ -2-propynyl) triphosphate, Cytosine-5'-(γ -2-propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -2-propynyl) triphosphate, Thymidine 5'-(γ -2-propynyl) triphosphate, Uracil-5'-(γ -2-propynyl) triphosphate, Adenosine-5'-(γ -3-butyryl) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -2-propynyl) triphosphate, Adenosine-5'-(γ -4-pentyryl) triphosphate, Adenosine-5'-(γ -5-pentyryl) triphosphate, Adenosine-5'-(γ -4-phenyl) triphosphate, Adenosine-5'-(γ -(4 or 6 or 8 acetoxymethyl naphthyl) triphosphate, Guanosine-5'-(γ -4-phenyl) triphosphate, Cytosine-5'-(γ -4-phenyl) triphosphate, Adenosine-5'-(γ -(4-methylpyridyl) triphosphate, Thymidine-5'-(γ -4-phenyl) triphosphate, Uracil-5'-(γ -4-phenyl) triphosphate, Adenosine-5'-(γ -(5-methoxypyridyl) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -4-phenyl) triphosphate, Adenosine-5'-(γ -(5-nitropyridyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-(γ -4-phenyl) triphosphate, Adenosine-5'-(γ -(5-acetoxymethylpyridyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -4-phenyl) triphosphate, Adenosine-5'-(γ -(6-

methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-carboxyphenyl) triphosphate,
 Adenosine-5'-(γ-(6-methoxy-1-quinolyl)triphosphate, Adenosine-5'- (γ- (4-acetoxymethyl)
 phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl)triphosphate, Adenosine-5'-
 (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl)triphosphate, Adenosine-5'-
 (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl) triphosphate,
 Adenosine-5'- (γ- (4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'- (γ-4-ethylphenyl)
 triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
 butylphenyl) triphosphate, Adenosine 5'-(γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl)triphosphate,
 Adenosine-5'- (γ- (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
 methoxynaphthyl) triphosphate, Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein)
 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-
 carboxymethyl-2, 7-dichlorofluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl
 naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4 nitrophenyl) triphosphate,
 Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl)triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4
 aminophenyl)triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-
 aminopropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-4-
 aminobutyl) triphosphate, Cytosine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-cyclohexyl)
 triphosphate, Thymidine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-2-carboxyethyl)
 triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-
 carboxypropyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (7-methyl) triphosphate,
 Adenosine-5'- (γ-4-carboxybutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-
 methyl) triphosphate, Adenosine-5'- (γ-2-hydroxyethyl) triphosphate, 2', 3'-didehydro-2', 3'-
 dideoxythymidine-5'-(γ-methyl)triphosphate, Adenosine-5'- (γ-3-hydroxypropyl)
 triphosphate, Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-propyl) triphosphate,
 Adenosine-5'- (γ-4-hydroxybutyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate,
 Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate,
 Adenosine-5'- (γ-3-nitropropyl) triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate,

93 Adenosine-5'- (γ-4-nitrobutyl) triphosphate, Adenosine-5'- (γ-tert-butyl) triphosphate
94 ,Adenosine-5'- (γ-methyl)- (γ'-ethyl)triphosphate, Adenosine-5'- (γ-cyclohexyl) triphosphate,
95 Adenosine-5'- (γ-2-aminoethyl)triphosphate, and Adenosine-5'- (γ-methyl)- (γ'-propyl)
96 triphosphate.

1 47.(new) The kit of claim 15, wherein the polymerizing agent is selected from the group
2 consisting of naturally occurring or synthetic polymerases and reverse transcriptases.